

CLAIMS

1. A steel wire for high-strength spring having superior workability, the steel wire having tempered martensite, the steel wire comprising by mass:

C: 0.53 to 0.68%;

Si: 1.2 to 2.5%;

Mn: 0.2 to 1.5%;

Cr: 1.4 to 2.5%;

Al: 0.05% or less, excluding 0%;

at least one selected from the group consisting of Ni: 0.4% or less, excluding 0%; V: 0.4% or less, excluding 0%; Mo: 0.05 to 0.5%; and Nb: 0.05 to 0.5%; and

remainder essentially consisting of Fe and inevitable impurities; wherein

the prior austenite grain size number is 11.0 or larger, and

a ratio ($\sigma_{0.2}/\sigma_B$) of 0.2% proof stress ($\sigma_{0.2}$) to tensile strength (σ_B) is 0.85 or lower.

2. The steel wire according to Claim 1, wherein the content of manganese ranges from 0.5 to 1.5%.

3. The steel wire according to Claim 1, wherein the 0.2% proof stress ($\sigma_{0.2}$) is raised by 300 MPa or more when

annealing at 400°C for 20 minutes is conducted.

4. A high-strength spring formed of the steel wire according to Claim 1.

5. The high-strength spring according to Claim 4, wherein:

the spring has a core part of a hardness Hv ranging from 550 to 700;

the spring has a compressive residual stress on an surface thereof at -400 MPa or lower; and

the residual stress of the spring is changed from a compression to a tension at a depth of from 0.05 mm to 0.5 mm from the surface of the spring.

6. The high-strength spring according to Claim 4, wherein:

the spring has a nitriding layer on a surface thereof;

the spring has a hardness Hv ranging from 750 to 1150 on the surface thereof;

the spring has a core part of a hardness Hv ranging from 550 to 700;

the spring has a hard layer of a hardness Hv larger than the hardness of the core part by 15 or more, the hard layer having a depth ranging from 0.02 mm to 0.15 mm;

the spring has a compressive residual stress on an surface thereof at -800 MPa or lower; and

the residual stress of the spring is changed from a compression to a tension at a depth of from 0.05 mm to 0.5 mm from the surface of the spring.